

At 31. (Amended) A process as claimed in claim 1, wherein the second fixed-bed catalyst comprises spherical catalysts.

REMARKS

Claims 1-31 are active in the present application. Claims 4-24 and 27-31 have been amended to remove multiple dependencies. No new matter is added. An action on the merits and allowance of claims is solicited.

Respectfully submitted,

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IN THE CLAIMS

--4. (Amended) A process as claimed in [any of claims 1 to 3] claim 1, wherein the reaction zone C extends to an acrolein conversion of from 65 to 80 mol%.

5. (Amended) A process as claimed in [any of claims 1 to 4] claim 1, wherein the temperature of the reaction zone B is at least 10°C above the temperature of the reaction zone A.

6. (Amended) A process as claimed in [any of claims 1 to 5] claim 1, wherein the temperature of the reaction zone D is at least 20°C above the temperature of the reaction zone C.

7. (Amended) A process as claimed in [any of claims 1 to 6] claim 1, wherein the temperature of the reaction zone B is from 305 to 340°C.

8. (Amended) A process as claimed in [any of claims 1 to 6] claim 1, wherein the temperature of the reaction zone B is from 310 to 330°C.

9. (Amended) A process as claimed in [any of claims 1 to 8] claim 1, wherein the temperature of the reaction zone C is from 245 to 260°C.

10. (Amended) A process as claimed in [any of claims 1 to 8] claim 1, wherein the temperature of the reaction zone D is from 265 to 285°C.

11. (Amended) A process as claimed in [any of claims 1 to 10] claim 1, wherein the propene conversion in a single pass in the first reaction stage is  $\geq 94$  mol%.

12. (Amended) A process as claimed in [any of claims 1 to 11] claim 1, wherein the selectivity of the acrolein formation and of the acrylic acid byproduct formation together in a single pass in the first reaction stage is  $\geq 94$  mol%.

13. (Amended) A process as claimed in [any of claims 1 to 12] claim 1, wherein the acrolein conversion in a single pass in the second reaction stage is  $\geq 94$  mol%.

14. (Amended) A process as claimed in [any of claims 1 to 13] claim 1, wherein the selectivity of the acrylic acid formation balanced over both reaction stages is  $\geq 85$  mol%, based on propene converted.

15. (Amended) A process as claimed in [any of claims 1 to 14] claim 1, wherein the propene loading of the first fixed-bed catalyst is  $\geq 165$  l(S.T.P.)/l · h.

16. (Amended) A process as claimed in [any of claims 1 to 15] claim 1, wherein the propene loading of the first fixed-bed catalyst is  $\geq 170$  l(S.T.P.)/l · h.

17. (Amended) A process as claimed in [any of claims 1 to 16] claim 1, wherein the at least one inert gas contained in the reaction gas starting mixture 1 comprises  $\geq 40\%$  by volume of molecular nitrogen.

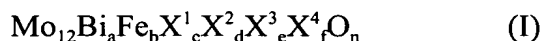
18. (Amended) A process as claimed in [any of claims 1 to 16] claim 1, wherein the at least one inert gas contained in the reaction gas starting mixture 1 comprises  $\geq 60\%$  by volume of molecular nitrogen.

19. (Amended) A process as claimed in [any of claims 1 to 18] claim 1, wherein the at least one inert gas contained in the reaction gas starting mixture 1 comprises steam.

20. (Amended) A process as claimed in [any of claims 1 to 19] claim 1, wherein the at least one inert gas contained in the reaction gas starting mixture 1 comprises CO<sub>2</sub> and/or CO.

21. (Amended) A process as claimed in [any of claims 1 to 20] claim 1, wherein the propene content of the reaction gas starting mixture 1 is from 4 to 15% by volume.

22. (Amended) A process as claimed in [any of claims 1 to 21] claim 1, wherein the active material of the first fixed-bed catalyst is at least one multimetal oxide of the formula I



where

X<sup>1</sup> is nickel and/or cobalt,

X<sup>2</sup> is thallium, an alkali metal and/or an alkaline earth metal,

X<sup>3</sup> is zinc, phosphorus, arsenic, boron, antimony, tin, cerium, lead and/or tungsten,

X<sup>4</sup> is silicon, aluminum, titanium and/or zirconium,

a is from 0.5 to 5,

b is from 0.01 to 5,

c is from 0 to 10,

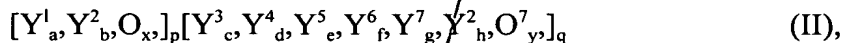
d is from 0 to 2,

e is from 0 to 8,

f is from 0 to 10 and

n is a number which is determined by the valency and frequency of the elements other than oxygen in I.

23. (Amended) A process as claimed in [any of claims 1 to 21] claim 1, wherein the active material of the first fixed-bed catalyst is at least one multimetal oxide of the formula II



where

Y<sup>1</sup> is bismuth, tellurium, antimony, tin and/or copper,

Y<sup>2</sup> is molybdenum and/or tungsten,

Y<sup>3</sup> is an alkali metal, thallium and/or samarium,

Y<sup>4</sup> is an alkaline earth metal, nickel, cobalt, copper, manganese, zinc, tin, cadmium and/or mercury,

Y<sup>5</sup> is iron, chromium, cerium and/or vanadium,

Y<sup>6</sup> is phosphorus, arsenic, boron and/or antimony,

Y<sup>7</sup> is a rare earth metal, titanium, zirconium, niobium, tantalum, rhenium, ruthenium, rhodium, silver, gold, aluminum, gallium, indium, silicon, germanium, lead, thorium and/or uranium,

a' is from 0.01 to 8,

b' is from 0.1 to 30,

c' is from 0 to 4,

d' is from 0 to 20,

e' is from 0 to 20,

f' is from 0 to 6,

g' is from 0 to 15,

h' is from 8 to 16,

x', y' are numbers which are determined by the valency and frequency of the elements other than oxygen in II and

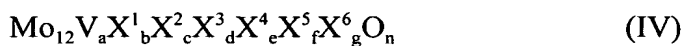
p, q are numbers whose ratio p/q is from 0.1 to 10,

containing three-dimensional regions which are delimited from their local environment as a result of their composition differing from their local environment and have the chemical composition Y<sub>a</sub><sup>1</sup>, Y<sub>b</sub><sup>2</sup>, O<sub>x</sub>, and whose maximum diameters are from 1 nm to 100 μm.

24. (Amended) A process as claimed in [any of claims 1 to 23] claim 1, wherein the first fixed-bed catalyst comprises annular and/or spherical catalysts.

27. (Amended) The process as claimed in [any of claims 1 to 26] claim 1, wherein the first and the second reaction stages are each carried out in a two-zone tube-bundle reactor.

28. (Amended) A process as claimed in [any of claims 1 to 27] claim 1, wherein the active material of the second fixed-bed catalyst is at least one multimetal oxide of the formula IV



where

X<sup>1</sup> is W, Nb, Ta, Cr and/or Ce,

X<sup>2</sup> is Cu, Ni, Co, Fe, Mn and/or Zn,

X<sup>3</sup> is Sb and/or Bi,

X<sup>4</sup> is one or more alkali metals,

X<sup>5</sup> is one or more alkaline earth metals,

X<sup>6</sup> is Si, Al, Ti and/or Zr,

a is from 1 to 6,

b is from 0.2 to 4,

c is from 0.5 to 18,

d is from 0 to 40,

e is from 0 to 2,

f is from 0 to 4,

g is from 0 to 40 and

n is a number which is determined by the valency and frequency of the elements other than oxygen in IV.

29. (Amended) A process as claimed in [any of claims 1 to 27] claim 1, wherein the active material of the second fixed-bed catalyst is at least one multimetal oxide of the formula VI



where

D is  $Mo_{12}V_aZ^1_bZ^2_cZ^3_dZ^4_eZ^5_fZ^6_gO_x$ ,

E is  $Z^7_{12}Cu_hH_iO_y$ ,

$Z^1$  is W, Nb, Ta, Cr and/or Ce,

$Z^2$  is Cu, Ni, Co, Fe, Mn and/or Zn,

$Z^3$  is Sb and/or Bi,

$Z^4$  is Li, Na, K, Rb, Cs and/or H,

$Z^5$  is Mg, Co, Sr and/or Ba,

$Z^6$  is Si, Al, Ti and/or Zr,

$Z^7$  is Mo, W, V, Nb and/or Ta,

a" is from 1 to 8,

b" is from 0.2 to 5,

c" is from 0 to 23,

d" is from 0 to 50,

e" is from 0 to 2,

f" is from 0 to 5,

g" is from 0 to 50,

h" is from 4 to 30,

i" is from 0 to 20 and

x",y" are numbers which are determined by the valency and frequency of the elements other than oxygen in VI and

p,q are numbers other than zero whose ratio p/q is from 160:1 to 1:1,

which is obtainable by separately preforming a multimetal oxide material (E)

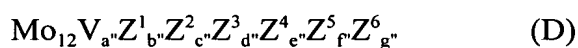


in finely divided form (starting material 1) and then incorporating the preformed solid

starting material 1 into an aqueous solution, an aqueous suspension or a finely divided dry

blend of sources of the elements Mo, V, Z<sup>1</sup>, Z<sup>2</sup>, Z<sup>3</sup>, Z<sup>4</sup>, Z<sup>5</sup>, Z<sup>6</sup>, which contains the

abovementioned elements in the stoichiometry D



(starting material 2), in the desired ratio p:q, drying any resulting aqueous mixture, and

calcining the dry precursor material thus obtained, before or after it has been dried, at

from 250 to 600°C to give the desired catalyst geometry.

30. (Amended) A process as claimed in [any of claims 1 to 29] claim 1, wherein the second fixed-bed catalyst comprises annular catalysts.

31. (Amended) A process as claimed in [any of claims 1 to 29] claim 1, wherein the second fixed-bed catalyst comprises spherical catalysts.--